FAG

FAG Motion Guard CHAMPION.CONTROL-TIME

Automatic lubricator

User manual

SCHAEFFLER GROUP
INDUSTRIAL

FAG CHAMPION.CONTROL-TIME

		Page
Features		3
	Application	3
	Scope of delivery	4
	Legal requirements	4
Safety guidelines	Responsible persons	4
	Principles	5
Technical data	Design	5
	Power supply	6
	LC unit, masses and dimensions	6
	Function	7
	Operating conditions	7
Dispensing quantity and dispensing time	Settings on the drive unit	8
	Dispensing table	9
	Calculation examples	9
Initial operation		11
	Initial operation	12
Changing the LC unit		13
	Changing the dispensing quantity, Reset function	14
Troubleshooting		15
Accessories and service	Accessories	16
	Service	16
	EU Declaration of Conformity	17
	PLC programming suggestions	18

FAG CHAMPION.CONTROL-TIME

Features

This user manual describes how to work safely on and with the automatic lubricator FAG Motion Guard CHAMPION.CONTROL-TIME. The safety guidelines must be observed.

Attention! Any persons working on and with the lubricator must have the user manual available for their work and must observe the relevant information and guidelines.

The user manual must always be complete and in a fully legible condition.

The relevant disposal guidelines must be observed.

From this point onward, the FAG Motion Guard CHAMPION. CONTROL-TIME is referred to as the lubricator and the lubricant cartridge as the LC unit.

Application

The lubricator is clearly identified by a sticker on the drive unit and the LC unit.

The lubricator is intended for machinery and plant where lubrication is to be carried out during running and feedback to the machine is required.

The lubricator supplies the lubrication point with oil or grease. The lubricant is dispensed at a pressure up to max. 5 bar at defined intervals, precisely, irrespective of temperature and under machine control.

Characteristic areas of application include the lubrication points on rolling and plain bearings, drive and conveyor chains, guidance systems, open gearboxes and seals.

Attention! The lubricator must only be used for the purposes stated in the order and confirmed by Schaeffler KG and in accordance with the conditions of use, settings and variations described in this user manual.

It must be ensured that the correct power supply and connection to the plant or controller (for example a PLC) are provided.

Connection should only be carried out using the original connection cable.

Connection should only be made by qualified skilled personnel and installation must comply with nationalen standards such as IEC or VDE.

The lubrication system must only be equipped with connections and pressure-resistant feed lines from Schaeffler KG.

The lubricator must be protected against chemically aggressive ambient media.

Scope of delivery

The lubricator can be used with three LC units of different sizes to meet individual requirements. The volume of the LC unit and the lubricator correspond to the specific order.
The delivery should be checked as soon as it is received. Schaeffler KG accepts no liability for any defects that are the subject of subsequent complaints.

Any damage in transport must be reported as a complaint to the deliverer, any missing items or defects must be reported as a complaint to Schaeffler KG.

Legal requirements

Liability

The information, data and guidelines given in the user manual were current at the time of editorial approval. The data, illustrations and descriptions cannot be used as grounds for any claims relating to lubricators that have already been delivered.

Attention!

Schaeffler KG accepts no liability for any damage or operational malfunctions that occur as a result of improper use or unauthorised changes to the drive unit or LC unit.

This also applies to incorrect work on or with the lubricator, errors in use or adjustment or incorrect variation sizes of the lubricator or a failure to observe the user manual.

Safety guidelines

Responsible persons

Operator

The operator is the natural or juristic person that uses the lubricator or on whose instruction the lubricator is used.

Attention!

The operator or his safety co-ordinator are responsible for compliance with all relevant specifications, guidelines and regulations.

All work on and with the lubricator may only be carried out by qualified personnel.

In mounting and maintenance of the lubricator, the relevant accident preventions specifications and safety specifications must be observed.

Qualified personnel

Persons that are authorised by the person responsible for safety of the plant, on the basis of their experience and knowledge, to carry out the activities required in the specific case.

Principles

The lubricator must be filled with the correct oil or grease and adjusted such that, when it is correctly adjusted and mounted and used as specified, it functions without defects and does not cause any hazards. This also applies to the interaction with the complete plant and the points to be lubricated.

Material damage that could arise due to failure of the lubricator must be prevented by suitable measures.

All retrofitting, modification and conversion of the lubricator is prohibited.

Attention!

While working on machinery and plant, the safety guidelines and user manuals of the manufacturers must be observed.

The LC unit must not be opened or refilled under any circumstances.

The safety data sheets for the oils and greases must be observed.

Only original LC units from Schaeffler KG may be used.

Technical data

Design

The lubricator corresponds to the state of technology at the time of delivery and is always regarded as operationally reliable.

It comprises, as shown in *Figure 1*:

- closing stopper ①
- LC unit ② containing lubricant, screw thread $R^1/_4$ (to be ordered separately).
- drive system ③, comprising a geared motor and an electronic unit (state serial number on any queries)
- LED function display ④
- cover ⑤
- cable with plug ⑥ (to be ordered separately).

With the exception of the LC unit, all the components can be reused several times.

① Closing stopper
② LC unit
③ Drive system
④ LED function display
⑤ Cover
⑥ Cable with plug

Figure 1
Components of the FAG lubricator

Power supply

Key data

Compilation of data:

Description		Technical data
Power supply		15 V DC to 25 V DC (max. 30 V DC, 5% residual ripple)
Current consumption		typically 0,2 A (max. starting current 1,2 A)
Conductor resistance		79,9 Ω/km at +20 °C
Permissible temperature	Stationary condition	–25 °C to +70 °C
	Moving condition	–5 °C to +70 °C

Cable design

Description	Technical data
Cross-section area of conductor	4 × 0,25 mm^2
Cord design, diameter	Cu cord 32 × 0,1 mm ∅, blk
Insulation	PVC, 1,3 + 0,05 mm ∅ Wall thickness approx. 0,32 mm
Material: cable outer sheath	PUR/black
Outputs	each max. 400 mA, short circuit-proof

Attention!

The cable is suitable for use in chain link trunking, the minimum bending radius is 60 mm.

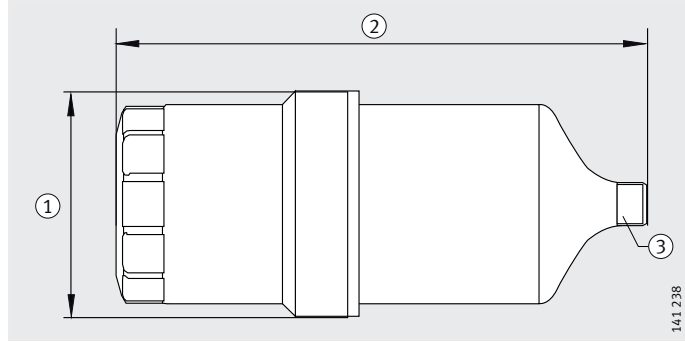
The power supply must be active for at least two minutes in order to ensure the correct running time.

The maximum load on the outputs (Pin 2 and Pin 4) must not exceed 400 mA in each case.

LC unit, masses and dimensions

The drive unit and LC unit together form the lubricator.

Type	Volume	Diameter	Total length	Mass	
		D	L	Empty	Filled with MULTITOP
	cm^3	mm	mm	kg	kg
LC60	60	71	142	0,310	approx. 0,360
LC120	120	71	165	0,320	approx. 0,430
LC250	250	71	215	0,360	approx. 0,590



① Diameter
② Length
③ Screw thread R$^1/_4$

Figure 2
Lubricator

Function

When the lubricator is continuously connected to the power grid, it dispenses an adjustable quantity in a defined time interval.

The lubricant is moved out of the LC unit by a driven spindle in the plunger. The plunger builds up a pressure of up to 5 bar in the LC unit; above this value, the automatic pressure limiter switches off the system after starting up several times.

The size of the LC unit and the dispensing quantity per dispensing cycle are set on the quadruplex encoder.

Dispensing quantity per dispensing cycle

Running time	Pause time	Dispensing quantity per dispensing cycle		
		LC60	LC120	LC250
Months	h:min	cm^3	cm^3	cm^3
1	1:30	0,13	0,26	0,53
3	4:37			
6	9:17			
12	18:36			

Operating conditions

Ambient temperature

A uniform dispensing behaviour and pressure build-up to a maximum of 5 bar can only be ensured in the temperature range from –10 °C to +50 °C.

Ambient conditions

If the individual components are fitted together correctly, the lubricators are resistant to dust and spray water. However, the sealing rings and plastics may be attacked by ambient media.

Storage

Lubricators must only be stored in interior rooms that are dry, dust-free and protected against sunlight, at a storage temperature of +15 °C to +25 °C.

The LC unit can be stored for up to two years; the lubricant fill date should be taken as the controlling factor. All other components should be replaced after a maximum of two years.

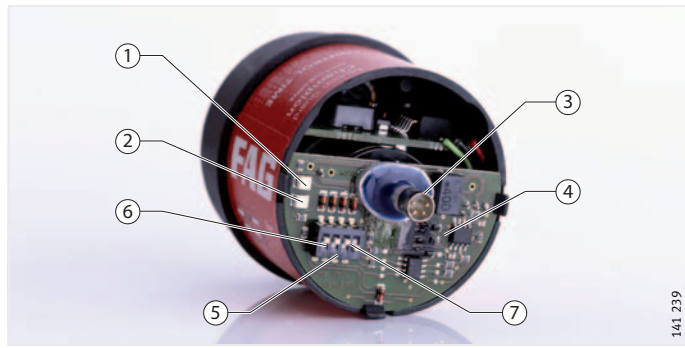
Dispensing quantity and dispensing time

Attention! Incorrect settings will lead to overlubrication or underlubrication with the possibility of secondary damage.

Settings on the drive unit

Unscrew the cover of the drive unit. The quadruplex encoder is located on the control circuit board, *Figure 3*.

The two switches ⑥ with the designation "TIME" are used to set the dispensing quantity. The position of the switch ⑦ with the designation "VOL" depends on the size of the LC unit. The switches can be adjusted with the aid of a small screwdriver. Screw the cover back onto the drive unit.



① Red LED
② Green LED
③ Jack
④ Circuit board
⑤ Quadruplex encoder
⑥ TIME (time adjustment)
⑦ VOL (volume of LC unit)

Figure 3
Control circuit board of drive unit

LED signals

The LEDs on the control circuit board, *Figure 3*, ① and ② are interpreted as follows:

LED lit	Signal	Description
Green	Green continuous signal	System running
Red	Red continuous signal ⩽30 s	Motor running: dispensing operation
Red	Red continuous signal ⩾30 s	Error or malfunction
Red and green	Red and green continuous signal	Replace LC unit immediately

Dispensing table

Settings on quadruplex encoder

Possible positions of quadruplex encoder

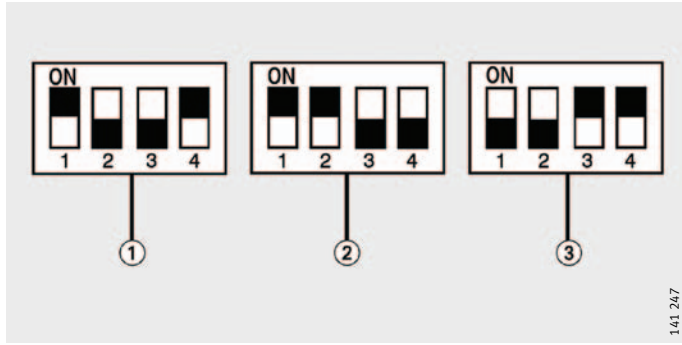
Quadruplex encoder				
Switch position “TIME”	Switch position “VOL”			Running time
	LC60	LC120	LC250	Dispensing quantity in cm^3 per 100 operating hours, 1 $cm^3 \approx$ 0,9 g lubricant
	8,33	16,67	34,72	≙ 1 month in continuous operation
	2,78	5,56	11,57	≙ 3 months in continuous operation
	1,39	2,78	5,79	≙ 6 months in continuous operation
	0,69	1,39	2,89	≙ 12 months in continuous operation

Calculation examples

Determination of the settings for optimum lubricant quantities. The examples relate to normal operation with dispensing intervals each of 100 operating hours.

Example 1 Uniform operation

- A rolling bearing is to be provided every 500 hours with 14 cm^3 of lubricant:
  - 14 cm^3 ÷ 500 h = 0,028 cm^3/h = 2,8 cm^3 per 100 h
  - The dispensing table offers a setting variant for each of the 3 available LC units.
- Variant A, *Figure 4* ①, page 10
  - 2,78 cm^3 per 100 h for a 60 cm^3 LC unit LC60
- Variant B, *Figure 4* ②, page 10
  - 2,78 cm^3 per 100 h for a 120 cm^3 LC unit LC120
- Variant C, *Figure 4* ③, page 10
  - 2,89 cm^3 per 100 h for a 250 cm^3 LC unit LC250



① Variant A
② Variant B
③ Variant C

Figure 4
Settings for example 1

Calculation of total running time

The total running time of the lubricator is the decisive factor in determining when the LC unit must be changed. If the rolling bearing to be lubricated is in a machine that runs for 8 hours on each of 5 days, the following running times are possible:

Variant A with 60 cm^3 LC unit (LC60)

- 2,78 cm^3 ÷ 100 h = 0,0278 cm^3/h
- 60 cm^3 ÷ 0,0278 cm^3/h = 2158,3 h
- 2158,3 h ÷ 40 h/week = 54 weeks

The lubricant will be sufficient for at least 1 year. No account is taken of plant shutdown or other machinery downtime.

Variant B with 120 cm^3 LC unit (LC120)

- 2,78 cm^3 ÷ 100 h = 0,0278 cm^3/h
- 120 cm^3 ÷ 0,0278 cm^3/h = 4316,5 h
- 4316,5 h ÷ 40 h/week = 108 weeks

The lubricant will be sufficient for at least 2 years. No account is taken of plant shutdown or other machinery downtime.

Variant C with 250 cm^3 LC unit (LC250)

- 2,89 cm^3 ÷ 100 h = 0,0289 cm^3/h
- 250 cm^3 ÷ 0,0289 cm^3/h = 8650,5 h
- 8650,5 h ÷ 40 h/week = 216 weeks

The lubricant will be sufficient for at least 4 years. Due to the storage life of the lubricants, however, variants A or B (note the fill date) should be recommended.

Example 2
Irregular operation

A rolling bearing is to be provided every 500 operating hours with 14 cm^3 of lubricant. It is in a machine that is used for limited periods.

For example:

- 4 h on the first day,
- 1,5 h on the second day,
- no operation on the third and fourth days,
- 3 h on the fifth day and so on.

- In this case, it is possible to calculate the correct switch settings based on the lubricant quantity per time period (calculation as in the first example), but not the precise point in time at which the LC should be changed.
- Running times of several years may be achieved. These lubrication points must be specially monitored. Monitoring can be polled in a PLC by means of the output signal “Dispensing end”. If the lubricant is used for a long period, attention must be paid to the storage life of the lubricant.

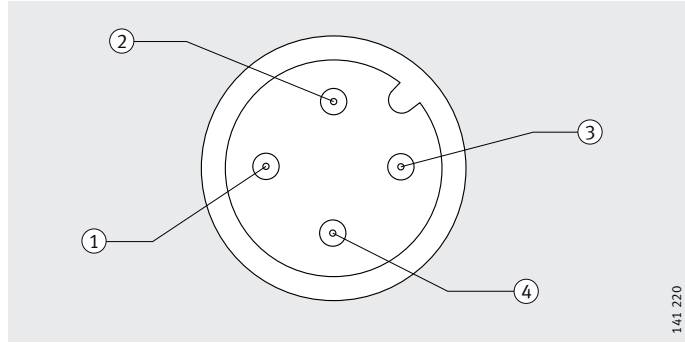
Initial operation

The FAG Motion Guard CHAMPION.CONTROL-TIME is delivered as standard without an LC unit and with a preset running time of 6 months.

Before the lubricator is installed, the lubrication points and the lubricant feed lines must be sufficiently prelubricated using the same lubricant as is contained in the lubricator.

Appropriate 400 g lubricant cartridges or oil containers are available as accessories.

- Support adapters (accessories) should be used for mounting.
- If the lubricator is mounted vertically, it should be secured using a retaining clip (accessory).



① Brown cable = power supply (plus)
② White cable = Green digital LED (output)
③ Blue cable = power supply (minus)
④ Black cable = Red digital LED (output)

Figure 5
Pin assignment

Initial operation

Attention!

Mount the lubricator using a support adapter or retaining clip.

Always check the settings of the lubricator before initial operation and make corrections as necessary.

Make connections precisely in accordance with the user manual. An incorrect connection can lead to destruction of the electronics.

Mount the lubricator filled with oil vertically, with the outlet facing down. Fit the oil valve. Provide additional sealing of the connectors using a suitable sealing material.

Work steps:

- Check the lubricator for external damage.
- Prelubricate the lubrication point and the feed lines.
- The thread of the LC unit must match the thread of the screw mounting point ($R^1/_4$).
- Connect the power cable in accordance with the PLC circuit diagrams to the status display in the switch cabinet.
- Check the settings on the encoder.
- Remove the closing stopper from the LC unit and screw the completed lubricator finger tight into the lubrication point. Do not screw in a second time since this can impair the self-sealing effect of the thread.
- Connect to the power grid.
- After Reset, operation will start with the set pause time, *Figure 6* ①, page 14.

During operation

Check seal integrity and the lubricant fill level as well as the correct position and finger tight screw mounting of all components regularly.

Changing the LC unit

Attention! The LC unit must not be opened or refilled under any circumstances.

Only new, completely filled FAG LC units should be used.

Protect the drive system and control circuit board against moisture. The unit should only be changed in dry conditions.

Dispose of old parts in accordance with the applicable regulations.

Once the red and green LEDs light at the same time, the empty LC unit must be replaced immediately.

Work steps:

- Disconnect from the power grid.
- Unscrew the lubricator completely from the lubrication point.
- Unscrew the cover of the drive system.
- Remove the drive system from the LC unit.
- If necessary, set the new size of the LC unit and dispensing quantity, see page 9.
- Position the drive system on the new LC unit, ensuring that the teeth engage with each other.
- Screw mount the cover of the drive system finger tight to the LC unit.

Continue the steps in accordance with “Initial operation”, page 12.

Changing the dispensing quantity
Reset function

The Reset function switches the lubricator to its base condition by restoring the stored parameters.

The process:

- Disconnect from the power grid.
- Unscrew the lubricator completely from the lubrication point.
- Unscrew the LC unit from the drive unit.
- Set the two switches “VOL” of the quadruplex encoder to the position ‘Reset’, *Figure 6* ②.

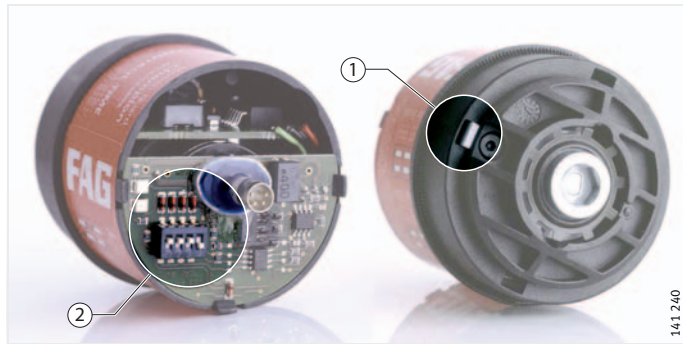
After these steps:

- Reconnect to the power grid.
- Once the motor has run for approximately 2 seconds, LED ① and LED ②, *Figure 3*, page 8 will light.
- Disconnect from the power grid.
- Make the new settings, see page 8.
- During setting, keep the Reset pin pressed, *Figure 6* ①.
- Reconnect to the power grid.
- After three seconds, release the Reset pin and disconnect from the power grid.
- Screw together the lubricator.

Attention!

During this operation, the requirement for replacement of the LC unit according to the fill level of the LC unit (continuous signal of the red and green LEDs) may be inappropriate.

Ensure that the condition is correct and monitor the end of the lubrication period on site.



① Reset pin on the drive unit (changes)
② Reset position of switch “VOL” (initial operation)

Figure 6
Reset for initial operation and for subsequent modifications

Troubleshooting

Malfunctions of the lubricator should be analysed and rectified using the table. Please contact Schaeffler Customer Service if a defect occurs that is not listed in the table.

Defect	Possible cause	Remedy
Lubricator not functioning	Cable connected incorrectly	☐ Check connection assignment
	Cable breakage	☐ Check power, connect new cable
	No power	☐ Power supply too low for the number of lubricators connected
	Machine relay defective	☐ Replace relay
Green LED indicating “System running” although LC unit is empty	Setting of “VOL” switch does not correspond to volume of LC unit	☐ Fit full LC unit
	Partially filled LC unit was replaced by almost empty LC unit	
Red LED indicating “Defect, malfunction”	Feed line and connectors are blocked	☐ Clean feed line and connectors, then switch off and on, see page 14
	Counterpressure too high	
Lubricator dispensing too quickly	Switches “VOL” and “TIME” are set incorrectly	☐ Correct switch settings, see page 8
Lubricator indicating “LC unit empty” (red and green LEDs) although lubricant is still present in the LC unit.	Setting of “VOL” switch does not correspond to LC unit	☐ Fit full LC unit
	Almost empty LC unit was replaced by partially filled LC unit	
	Reset pin was not pressed during assembly	☐ Move drive unit by a few teeth so that the the Reset pin can be pressed
Incorrect dispensing quantity	Encoder was subsequently changed to incorrect setting	☐ Make corrections, see page 8

Accessories and service

Accessories and replacement parts must conform to the technical requirements. This is ensured when using original replacement parts from Schaeffler KG.

Accessories

Description	Technical data	Ordering designation
Cable with jack plug	5 m	ARCALUB-CONTROL.CABLE-5M
Support bracket	Thread $G^1/_4$, external	ARCALUB.ADAPTER
Retaining clip	–	ARCALUB.CLIP
Holder with insert	–	ARCALUB.HOLDER-KIT
Oil valve	–	ARCALUB.OILVALV-$G^1/_4$
400 g grease cartridge or oil in container for prelubrication	–	Available by agreement

Other accessories available by agreement.

Service

The operator has the option of returning the empty lubricator FAG Motion Guard CHAMPION.CONTROL-TIME to Schaeffler KG for:

- disposal of the used parts in an environmentally-friendly manner,
- replacement of the LC unit,
- setting of the required dispensing quantity.

EU Declaration of Conformity

EU Declaration of Conformity

In accordance with EG Machinery Directive 98/37/EG

and EMC Directive 89/336EWG

We hereby declare that the product described below is in conformity with the applicable health and requirements of the EU Directive in terms of its design and type and in the execution we have brought into circulation.
This declaration shall cease to be valid if any modification is made to the product without our agreement.

Product description:	Automatic lubricator
Product name:	FAG Motion Guard CHAMPION.CONTROL-TIME
Type:	LC60, LC120 and LC250

Applicable harmonised standards:

EN ISO 12100-1:2003	Safety of machinery – Basic concepts, general principles for design – Part 1: Basic terminology and methodology
EN ISO 12100-2:2003	Safety of machinery – Basic concepts, general principles for design – Part 2: Technical principles
EN 60204-1:1998	Electrical equipment of machines

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F'IS Lubrication Products

Date:
Schweinfurt, 31.01.2008

This declaration certifies conformity with the stated directives but does not represent a guarantee of characteristics.
The safety guidelines in the user manual must be observed.

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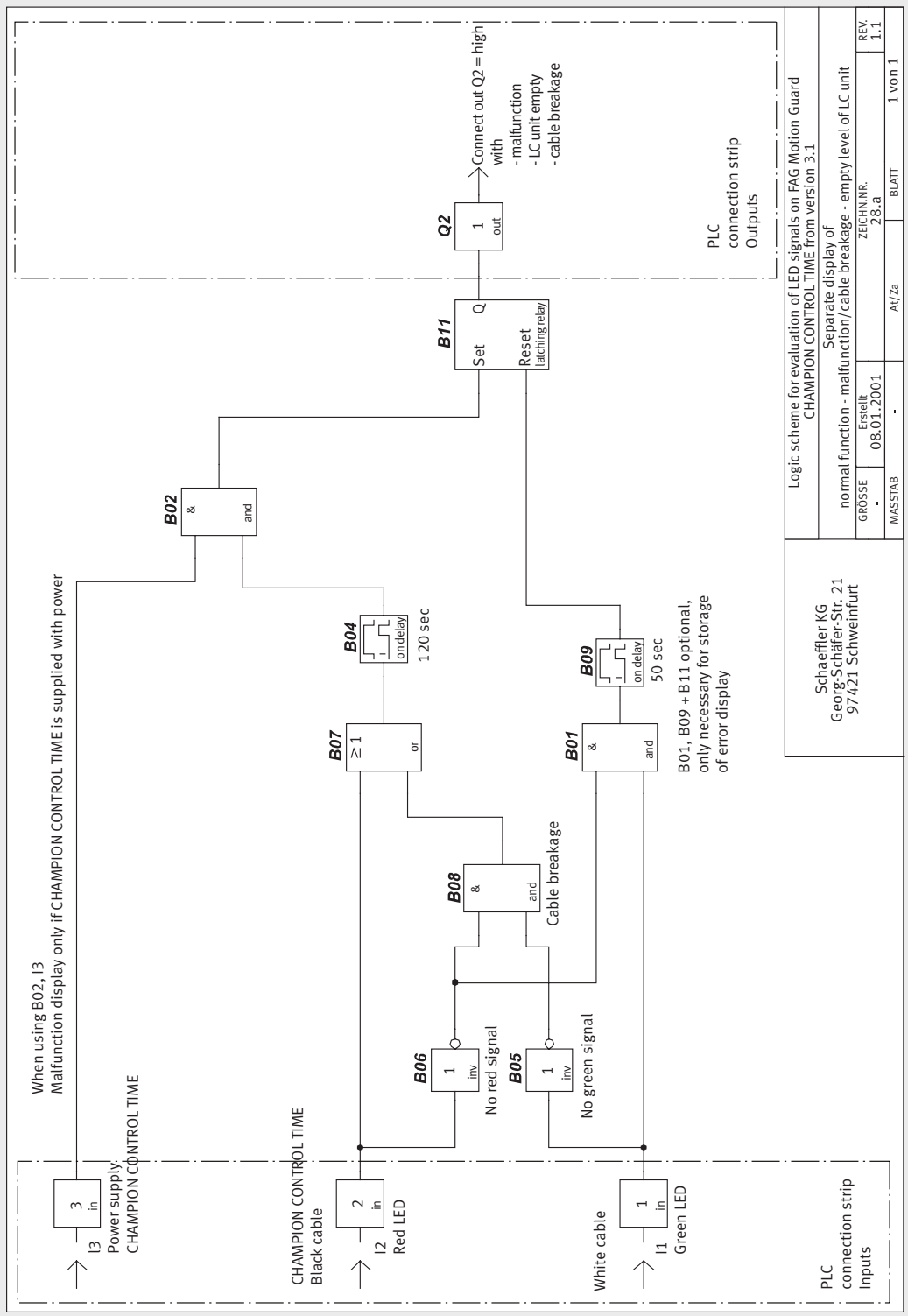
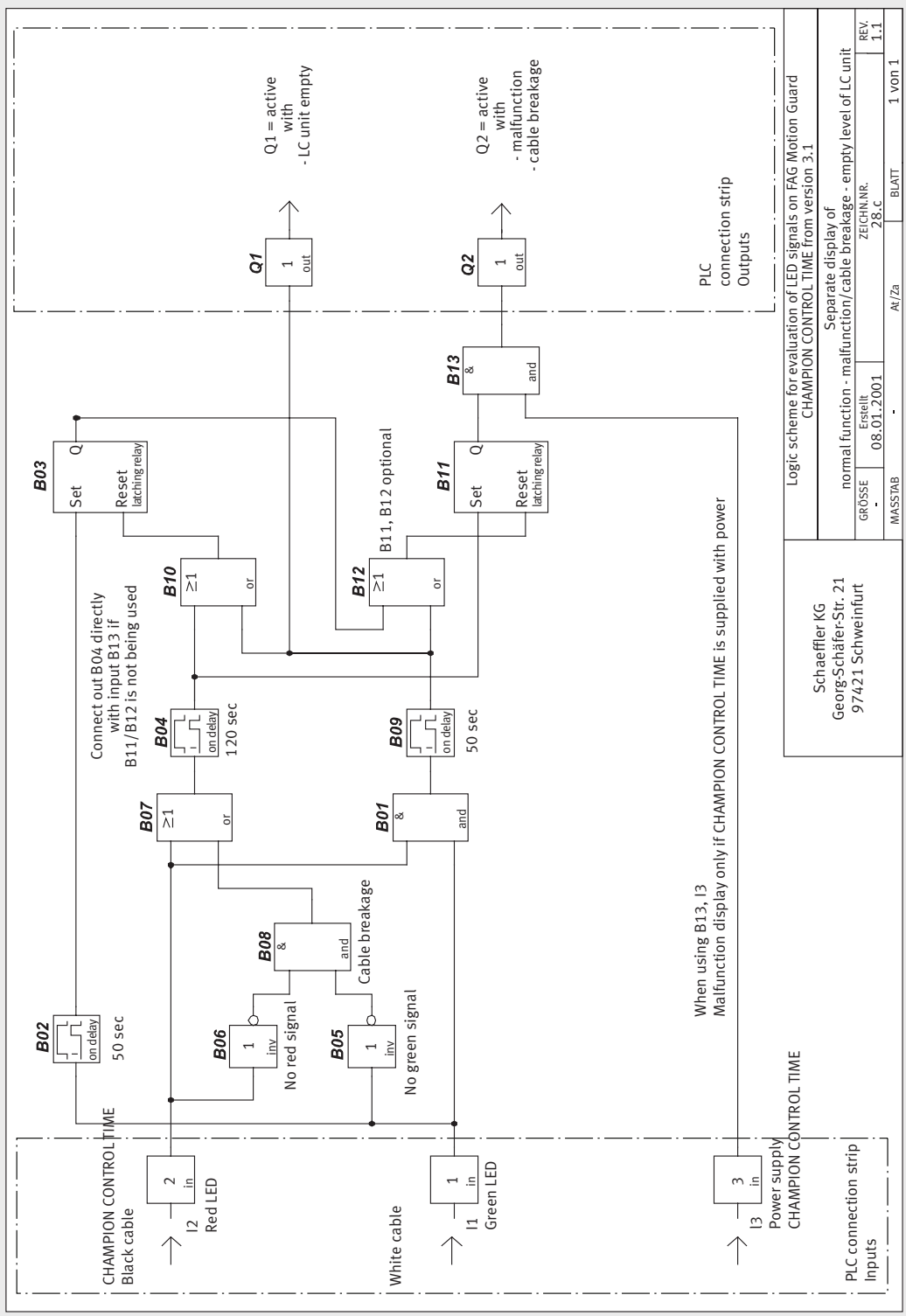
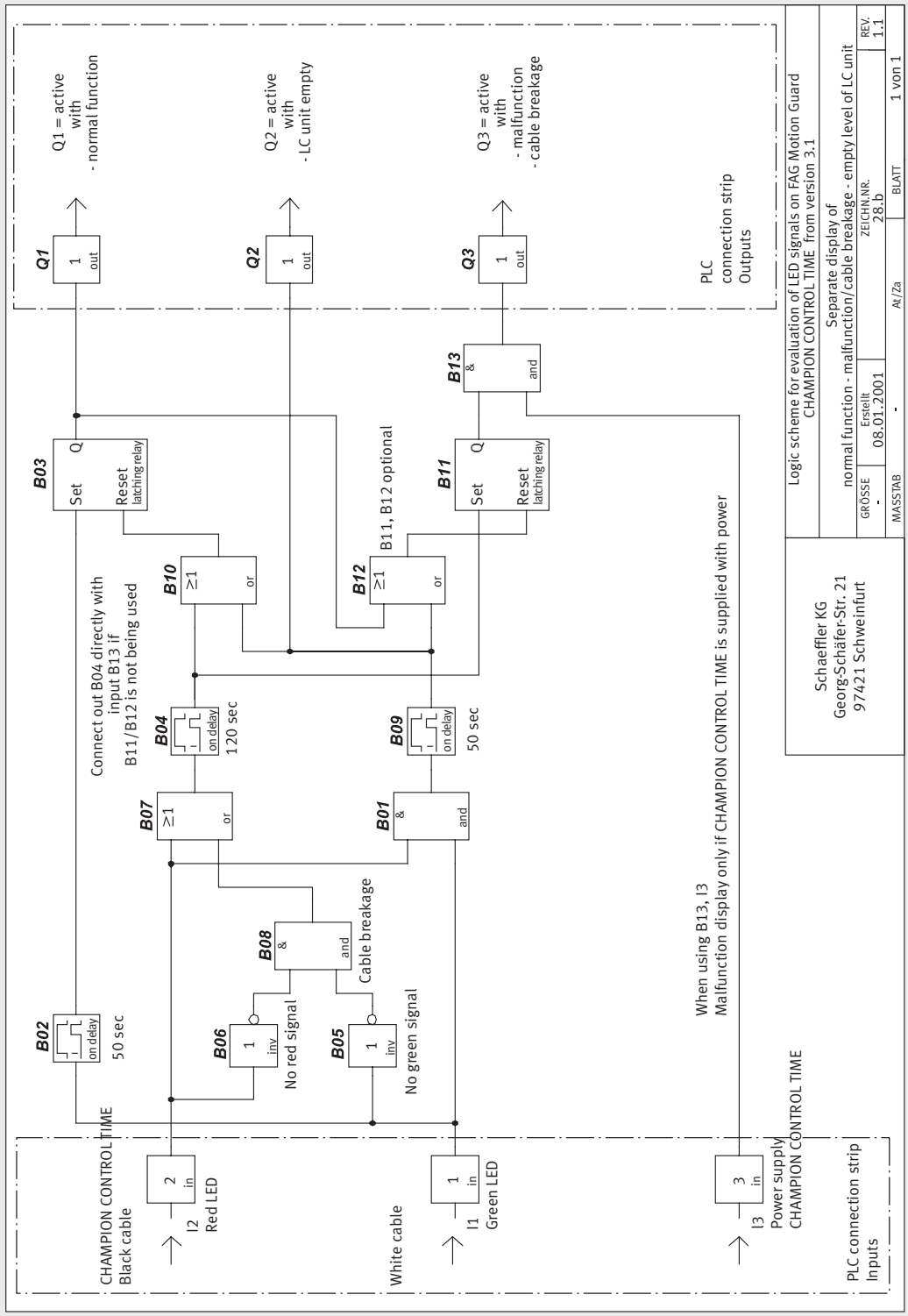
PLC programming suggestion with one output signal



PLC programming suggestion with two output signals



PLC programming suggestion with three output signals


Logic scheme for evaluation of LED signals on FAG Motion Guard
CHAMPION CONTROL TIME from version 3.1
Separate display of
normal function - malfunction/cable breakage - empty level of LC unit
Schaeffler KG
Georg-Schäfer-Str. 21
97421 Schweinfurt
PLC connection strip Inputs
CHAMPION CONTROL TIME
Black cable
I2 Red LED
White cable
I1 Green LED
Power supply CHAMPION CONTROL TIME
I3
PLC connection strip Outputs
Q1 = active with - normal function
Q2 = active with - LC unit empty
Q3 = active with - malfunction - cable breakage
B02 on delay 50 sec
B03 Set Reset latching relay
B04 on delay 120 sec
B05 inv No green signal
B06 inv No red signal
B07 ≥1 or
B08 & and Cable breakage
B09 on delay 50 sec
B10 ≥1 or
B11 Set Reset latching relay
B12 ≥1 or B11, B12 optional
B13 & and
Connect out B04 directly with input B13 if B11/B12 is not being used
When using B13, I3 Malfunction display only if CHAMPION CONTROL TIME is supplied with power

Notes

Notes

Notes

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